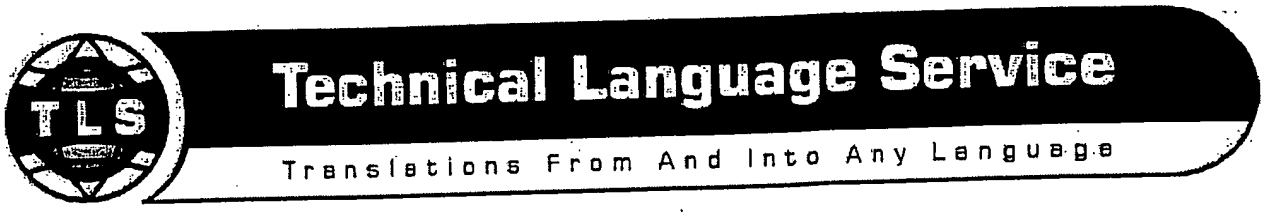


JAPANESE / ENGLISH TRANSLATION OF

Source: Japanese Patent Application JP 53 – 14094 A

Title of the Invention: Tow Packing Device

Your Ref.#: No. 3749

**For: Eastman Chemical Company -
Library and Information Services (LibrIS)**

9109 Eagle Hills Dr . Las Vegas NV 89134 . ph: 866-722-7990 (toll-free) . fax: 702-973-6009
email: sales@tls-translations.com

(19) Japanese Patent Office (JP)

(11) Unexamined Patent Application (Kokai) No.

(12) **Unexamined Patent Gazette (A)**

53–14094

(51) Int. Cl.[2]	Classification Symbols	(52) Japanese Classification	Internal Office Registration Nos.
B 65 B 27/12 B 30 B 9/30		134 A 412	7633-38

(43) Date of Publication: February 8, 1978

Request for Examination: Submitted

Number of Inventions: 1

Total of 4 pages [in original]

(54) **Title of the Invention**: Tow Packing Device

(21) Application No.: 51-86862

(22) Date of Filing: July 21, 1976

(72) Inventor: Eiji MIYAZAKI
9-8 Kamirenjaku 2-chome, Mitaka-shi, Tokyo-to

(72) Inventor: Tsuyoshi TANAKA
220 Teramae-cho, Kanazawa-ku, Yokohama-shi

(71) Applicant: Saito Ironworks, Co., Ltd.
22-23 Higashi Shinagawa 3-chome, Shinagawa-ku, Tokyo-to

(74) Agent: Yoshiharu KABAZAWA, Patent Attorney (and 3 others)

SPECIFICATION

1. Title of the Invention

Tow Packing Device

2. Claims

1) A tow packing apparatus characterized in comprising:

a receiving box;

a receiving plate vertically movably provided in the receiving box;

an apparatus for vertically moving the receiving plate that moves the receiving plate up or down in the receiving box when tow is received in said receiving box;

a tow supply apparatus provided to an upper part of said receiving box for feeding tow into the receiving box;

a compression box connectably disposed to said receiving box; and

a compression apparatus provided to said compression box for compressing tow within the compression box into a packed form.

2) The tow packing apparatus of Claim 1 characterized in that the receiving box is moveably provided between a tow supplying position and a tow compression position, so that in the tow supply position, a feed of tow will be received, while in the tow compressing position, a connection to the compression box will be established and tow will be moved to the compression box.

3) The tow packing apparatus of Claim 1 characterized in that the compression box is movably provided between a tow compression position and a tow receiving position when connected to the receiving box, so that the tow is preliminarily compressed and received in the compression box in the tow receiving position, and the tow in the compression box is then subjected to the main compression and formed into a packed form in the tow compression position.

3. Detailed Description of the Invention

The present invention relates to an apparatus for packing tow (continuous fiber bundles) in high densities.

When conventionally packed, tow is stored in cartons made of corrugated cardboard or another material. In order to stuff the carton to a slightly higher density when the tow is placed therein, e.g., a hopper is placed above the carton opening, [the contents] are compacted within the strength range of the carton, the hopper is removed, and the carton is covered with a lid.

However, tow cannot be packed densely with such packing methods due to the strength of the carton box and other factors. Consequently, the overall volume increases, which increases transport costs; and greater warehousing space is used, which increases storage costs. If the

carton is reinforced to increase its strength, packing material costs will increase. Furthermore, carton volumes have necessarily increased due to the greater weight of packed contents that has accompanied increasing demand over the past several years, and complications have been presented in regard to the handling of the cartons themselves.

With the foregoing aspects in view, it is an object of the present invention to provide a tow packing apparatus that will compress tow in higher densities and increase the density of the packing, while allowing the weight of the packed contents to increase, and the costs of the packing materials to be reduced.

An embodiment of the present invention shall be described hereunder with reference to FIG. 1.

The symbol (1) indicates a frame, on which a pair of rails are provided in parallel. A tow receiving/moving stand (3) is advanceably and retractably supported on either side on the pair of rails (2) via pivotally installed wheels (4). A squarely cylindrical receiving box (5) with open upper and lower surfaces is mounted on the tow receiving/moving stand (3), and a receiving plate (6) is provided to the receiving box (5) so as to be movable in an upward and downward direction and so as not to pass downwardly through a bottom end opening of the receiving box (5). The receiving plate (6) is advanceably and retractably provided so as to open and close the bottom end opening of the receiving box (5) when at the bottom end position of the receiving box (5).

An apparatus (7) for moving the receiving plate upward or downward is provided to the bottom region of the tow supply position (A) in the receiving box (5). A cylinder apparatus (8) for moving the receiving plate upward and downward, and associated with the apparatus (7), is provided to the frame (1); and a support plate (10) facing a lower surface of the receiving plate (6) is mounted on an upper end of a piston rod (9) protruding upward from the cylinder apparatus (8).

A tow supply apparatus (11) is disposed on an upper part of the tow supply position (A). A pair of rails (1) associated with the tow supply apparatus (11) is provided in parallel to the frame (1). A cart (13) is advanceably and retractably supported on both sides on the pair of

rails (12) via pivotally installed wheels (14). A tow supply chute (15) is rotatably provided to the center portion of the cart (13) in an upper region thereof in a direction perpendicular to the direction of movement of the cart (13). A pair of tow guiding rollers (16) is further disposed in an upward position on the cart (13), so that tow (17) will be continuously supplied via this pair of tow guiding rollers (16).

A compressing apparatus (21) is disposed below the end region of the rails (2) on which the receiving box (5) moves. A vertical shaft (22) in the compressing apparatus (21) is supported on the frame (1). On either side of the vertical shaft (22) is a pair of squarely cylindrical compression boxes (23) whose upper and lower surfaces are open, and which are rotatably supported in the horizontal direction with the vertical shaft (22) as the center. Door plates (24) that, when closed, constitute a part of the compression boxes (23), are openably and closably attached to the four peripheral surfaces in the upper parts of the compression boxes (23). A plurality of rod insertion holes (25) are formed in positions directly across from each other along the upper portion of each pair of corresponding door plates.

Receiving plates (26) are vertically movably provided to the compression boxes (23), and are provided so as not to pass downwardly through a bottom end opening of the compression boxes (23). The upper surface of the receiving plate (26) is provided with a plurality of guide grooves (27). An apparatus (28) for moving the receiving plate upward or downward is provided to a lower region of a tow receiving position (B) located in one of the compression boxes (23). A cylinder apparatus (29) for moving the receiving plate upward or downward, and associated with the apparatus (28), is provided to the frame (1); and a support plate (31) that faces a lower surface of the receiving plate (26) is mounted on an upper end portion of a piston rod (30) upwardly protruding from the cylinder apparatus (29).

A preliminary compression apparatus (32) is provided to an upper part of the tow receiving position (B). A preliminary compression cylinder apparatus (33) associated with the compression apparatus (32) is provided to the frame (1), and an urging body (35) is mounted on a lower end of a piston rod (34) downwardly protruding from the compression cylinder apparatus (33). A plurality of rod guide grooves (36) are formed on a lower surface of the urging body (35) in positions corresponding to the rod insertion holes (25) of the door plates (24).

A compression apparatus (37) is provided to a lower part of a tow compressing position (C) located in the other compression box (23). A compression cylinder apparatus (38) associated with the compression apparatus (37) is provided to the frame (1), and an urging body (40) that faces a lower surface of the receiving plate (26) is mounted on an upper end of a piston rod (39) upwardly protruding from the compression cylinder apparatus (38). A pressure-receiving body (41) facing an upper end surface of the compression box (23) is provided to an upper part of the tow compression position (C) on the frame (1), and on an upper surface of the pressure-receiving body (41) are formed a plurality of guide grooves (42), which correspond to the guide grooves (27) of the receiving plate (26).

The operation of the invention shall be described hereunder.

First, the receiving box (5) is set in the tow supply position (A). The cylinder apparatus (8) used for moving the receiving plate upward and downward is upwardly actuated, and the support plate (10) is raised by the associated piston rod (9). The receiving plate (6) of the receiving box (5) is supported on the support plate (10), and rises in the receiving box (5). The receiving plate (6) is stopped at the upper end thereof. The upper surface of the receiving plate (6) and the lower end opening of the tow supply chute (15) are set so that a prescribed gap; e.g., 1 to 50 cm, will be maintained with the tow supply chute (15) in a perpendicularly suspended state.

Next, the tow supply device (11) is actuated so that the feed of tow (17) is initiated. The tow guiding rollers (16) deliver the tow (17) from the tow supply chute (15) into the receiving box (5). At this time, the cart (13) of the tow supply device (11) will reciprocatingly advance and retract on the rails (12) at a uniform rate across the width of the receiving box (5) opening, and the tow supply chute (15) will be turned in a reciprocal fashion at a uniform rate or a substantially uniform rate, so that there will be a fixed rate at which the tip thereof projects across the width of the other opening of the receiving box (5), in a direction perpendicular to the direction in which the cart (13) advances. Accordingly, the reciprocatory advancing and retracting movement of the cart (13) and the pendulum-like reciprocating rotary movement of the tow supply chute (15) will neatly load the tow (17) in a zigzag fashion on the receiving plate (6) in the receiving box (5).

The cylinder apparatus (8) for moving the receiving plate upward and downward is downwardly actuated at the same time that the tow (17) is being supplied, and the receiving plate (6) will be lowered together with the support plate (10) in synchronization with the rate at which the tow (17) is supplied. At this time, the aforementioned prescribed gap will be maintained between the upper surface of the tow (17) that has been loaded on the receiving plate (6) and the bottom end opening of the tow supply chute (15).

As the receiving plate (6) descends, the tow (17) will be loaded continuously in a zigzag fashion in the receiving box (5), and once the receiving plate (6) reaches its lowest position, the supply of tow (17) will be halted, and the tow (17) will be cut at the tip end of the tow supply chute (15), and terminated.

Next, the tow receiving/moving stand (3) is moved along the rails (2), and the receiving box (5) is moved from the tow supply position (A) to the tow receiving position (B) of the compression apparatus (21).

At this time, the pair of compression boxes (23) are set in the tow receiving position (B) and the tow compressing position (C), respectively. The cylinder apparatus (29) for moving the receiving plate upward and downward is upwardly actuated, and the support plate (31) is raised by the associated piston rod (30). The receiving plate (26) of the compression box (23) in the tow receiving position (B) is supported on the support plate (31), rises in the compression box (23), and is then stopped at the upper end thereof.

In the resulting state, the receiving plate (6) of the receiving box (5) is moved, and the opening at the lower end of the receiving box (23)[1] is released. While the tow (17) that has been loaded in the receiving box (5) is supported by the receiving plate (26) in the compression box (23), the cylinder apparatus (29) used for moving the receiving plate upward and downward is downwardly actuated, the receiving plate (26) is lowered together with the support plate (31), and the compression box (23) receives the loaded tow (17) from the bottom part thereof. Once the receiving plate (26) has reached its lowest position, the preliminary compression cylinder apparatus (33) is downwardly actuated, and the urging body (35) is moved downward into the

[1] [Translator's note: This symbol appears to be a mistake for (5), since (23) is the symbol for the compression boxes.]

receiving box (5) via the piston rod (34) associated with the compression cylinder apparatus (33). The tow (17) that has been loaded in the receiving box (5) is pushed out by the urging body (35). All of the tow (17) within the receiving box (5) is urged into the compression box (23), and the tow (17) is preliminarily compressed between the urging body (35) and the receiving plate (26).

Next, rods (not shown) are inserted via the rod guide grooves (36) on the urging body (35) from the rod-insertion holes (25) between corresponding door plates (24) in the compression box (23). The upper surface of the tow (17) in the compression box (23) is secured to retain the preliminarily compressed shape of the tow (17).

Next, the pair of compression boxes (23) are rotated 180° around the vertical shaft (22), so that the compression box (23) in which the tow (17) has been received will be moved from the tow receiving position (B) to the tow compressing position (C), and the other compression box (23) will be moved from the tow compressing position (C) to the tow receiving position (B). The tow (17) is then received, in the same manner as described hereinabove, in the compression box (23) that has been newly placed in the tow receiving position (B).

Meanwhile, once the compression box (23) containing the tow (17) is set to the tow compressing position (C), the rods located on the upper end surface of the tow (17) are removed, whereupon the compressing cylinder apparatus (38) is upwardly actuated, and the urging body (40) is upwardly actuated via the piston rod (39). The receiving plate (26), supported by the urging body (40), is raised in the compression box (23), and compresses the tow (17) between the receiving plate (26) and the pressure-receiving plate (41). The door plates (24) are released to yield a block (17_a) of compressed tow (17) in a packed configuration.

Next, a band-applying apparatus (not shown) is used to wind and then firmly tighten a plurality of tightening bands made of steel plates or another material around the periphery of the compressed block (17_a) via the guide grooves (27) of the receiving plate (26) and the guide grooves (42) of the pressure-receiving plate (41). The periphery of the compressed block (17_a) may be covered from above and below with a packaging material made of Hessian cloth or the like before the bands are applied thereto. The pressure is then released, whereupon the receiving plate (26) is lowered to the withdrawing position, and the block (17_a) of compressed tow (17) is removed.

When the tow (17) has been moved to the compression box (23) from the receiving box (5), the tow (17) is received with the receiving plate (26) in the raised state, and moved as the receiving plate (26) is gradually lowered. In certain circumstances, the tow (17) may alternatively be lowered with the receiving plate (26) positioned in the lower end of the compression box (23).

If the tow (17) that has been moved from the receiving box (5) to the compression box (23) does not have a large mass, preliminary compression need not be performed.

Whereas in the apparatus shown in FIG. 1, tow is received from above the compression boxes and subjected to preliminary compression, in the apparatus shown in FIG. 2 the tow is received from below the compression boxes and subjected to preliminary compression from therebelow.

In other words, in the apparatus shown in FIG. 1, a preliminary compression apparatus (32) is provided to the upper part of the tow receiving position (B) of the compression box (23); however, [in the apparatus shown in FIG. 2] the preliminary compression apparatus (32) is disposed in the lower part of the tow receiving position (B) of the compression box (23), a receiving plate (26) and apparatus (28) for moving the receiving plate upward or downward are not provided, but an apparatus for moving the receiving plate upward or downward by means of the preliminary compression apparatus (32) is additionally provided. In addition to this configuration, a plurality of guide grooves (6_a) are formed on the upper surface of the receiving plate (6) of the receiving box (5), rod insertion holes (25) are formed along the lower region of the compression box (23), and pressure receiving bodies (41) that move in concert with the compression box (23) are provided to the openings on the upper ends of the pair of compression boxes (23). The remaining structures are conceptually similar.

The receiving box (5) is set to the tow receiving position (B) of the compression box (23), and the preliminary compression apparatus (32) is actuated. The tow (17) in the receiving box (5) is urged into the compression box (23), and compressed against the pressure receiving body (41). The lower surface of the preliminarily compressed tow (17) is locked in place by rods (not shown), and [the receiving box (5)] is moved to the compression position (C).

If preliminary compression is performed, it is possible for rod insertion holes to be provided to the upper portion of the compression box (23) as with the rod insertion holes (25) in the lower portion, and a pressure-receiving body (41) not to be provided to the upper part, so that the upper surface of the tow (17) will be supported by the rods.

An example in which an apparatus is incorporated into a line is shown in FIGS. 3 and 4. The line is configured with a plurality of receiving boxes (5) movably provided in the forward, backward, rightward, and leftward directions, with the tow (17) being fed simultaneously by the tow supply apparatus (11) in the tow supply position (A) in which the plurality of receiving boxes (5) have been serially arranged. The receiving boxes (5) to which the tow (17) is fed are successively connected to the compression boxes (23) of the compression apparatus (21) in the tow receiving position (B), so that the tow will be subjected to preliminary and main compression. Such a configuration allows the compressing and packing tasks to be performed continuously.

The receiving boxes (5) and compression boxes (23) may be moved via a turntable, conveyor, cart system, or other appropriate method. The tow (27) in the compression box (23) may be compressed by being urged from the bottom in an upward direction, or from the top in a downward direction.

According to the present invention, tow is received in a receiving box, moved to a compression box, and then greatly compressed, thus allowing the tow to be compressed very densely. Greater packing densities can be achieved, and heavier packed articles can be accommodated. In addition, cartons and the like are dispensed with, thus reducing the packaging material cost.

Furthermore, when the tow is being received, the receiving plate is lowered within the receiving boxes in synchronization with the tow feed rate, which allows the tow fed from the tow supplying device to be loaded in a systematic and orderly manner. The tow can be neatly packed when compressed in such a state, which allows greater packing densities to be realized and the removal of the tow in the subsequent step to be performed in a smooth manner.

The tow is received in the receiving box, whereupon it is received in the compression box, and then compressed; therefore, a plurality of receiving boxes may be successively connected in a continuous manner to compression boxes, and the compression and packing tasks may be efficiently performed.

Making the volume of the receiving box greater than that of the compression box and subjecting the tow received in the receiving box to preliminary and main compression will allow substantially higher densities to be realized.

4. Brief Description of the Drawings

FIG. 1 is a partially cut-away front view showing an embodiment of the apparatus of the present invention;

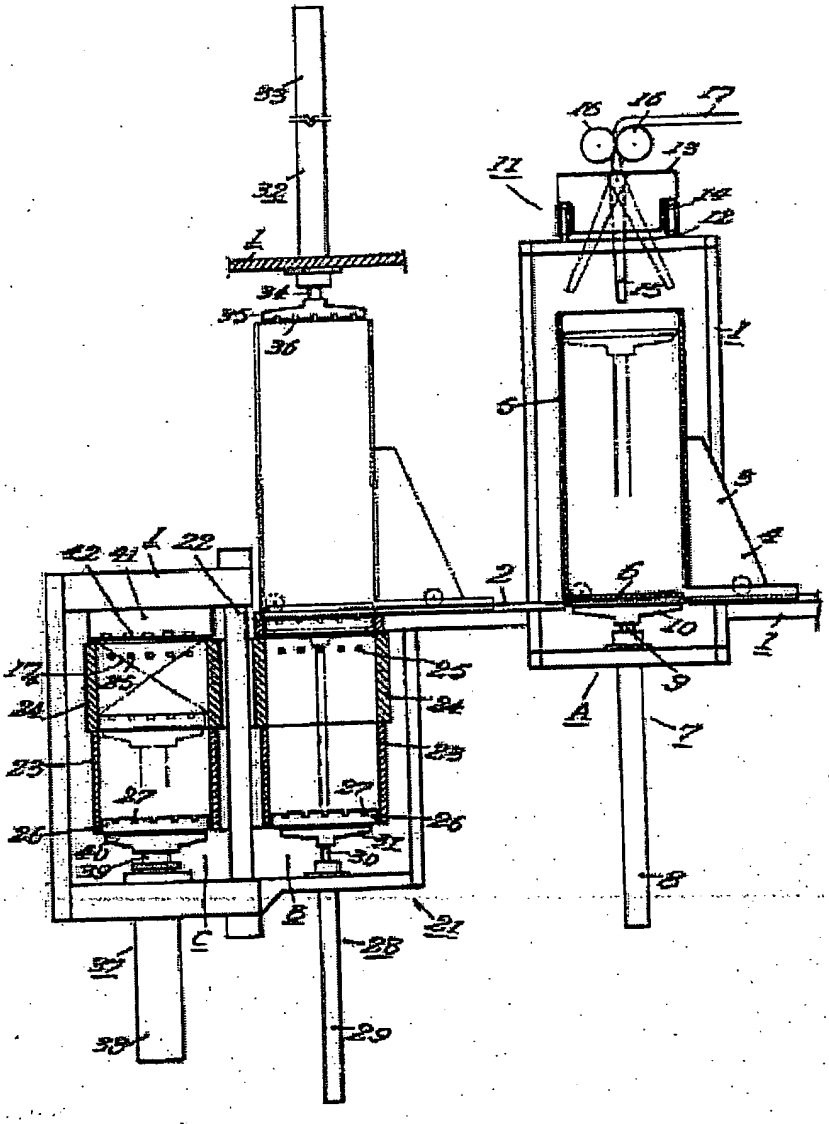
FIG. 2 is a partially cut-away front view showing another embodiment of the apparatus of the present invention;

FIG. 3 is a front view showing a state in which the apparatus of the present invention has been incorporated into a line; and

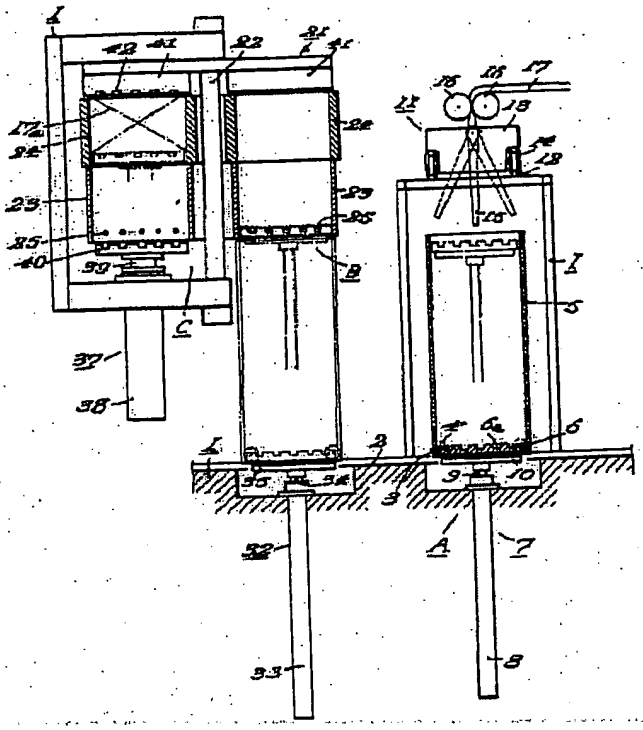
FIG. 4 is a plan view of the view described in FIG. 3.

(5) Receiving box
(6) Receiving plate
(7) Apparatus for moving receiving plate upward or downward
(11) Tow supply apparatus
(17) Tow
(21) Compression apparatus
(23) Compression box
(A) Tow supplying position
(B) Tow receiving position
(C) Tow compression position.

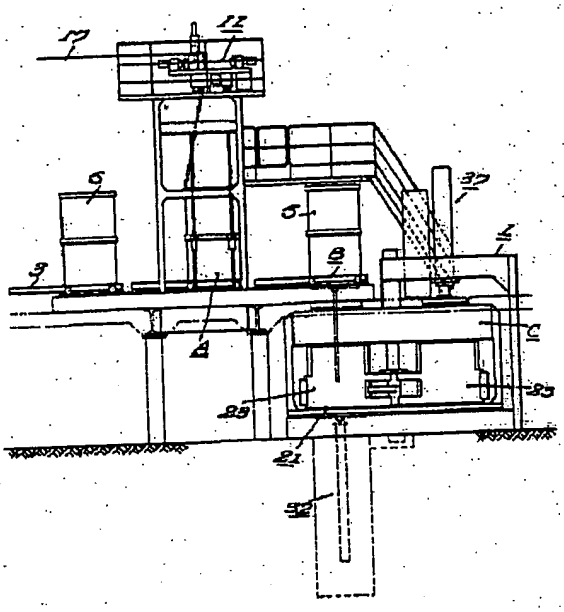
[Figure 1]



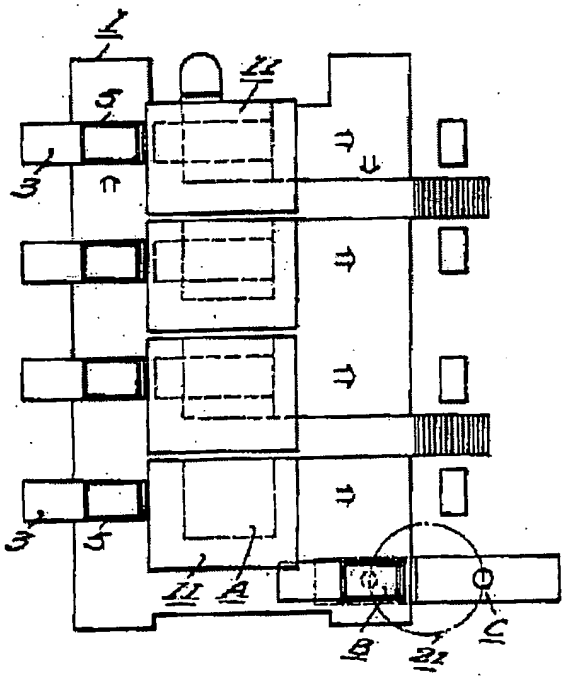
[Figure 2]



[Figure 3]



[Figure 4]



METHOD OF PACKING TOW

Patent number: JP53074994
Publication date: 1978-07-03
Inventor: TSUTSUMI TAKAO
Applicant: KAWASAKI HEAVY IND LTD
Classification:
- international: B30B9/30; B65B27/12; B30B9/00; B65B27/00; (IPC1-7): B30B9/30; B65B27/12
- european:
Application number: JP19760147673 19761210
Priority number(s): JP19760147673 19761210

Abstract of JP53074994

PURPOSE:To increase the quantity of synthetic fiber stalks per unit package and also facilitate the handling by using hession cloth or films as packing material.